

The Shift Towards Environmentally Friendly Electric Cars: Presenting the European Experience and Defining Prospects in Algeria

La transition vers les voitures électriques respectueuses de l'environnement: Présentation de l'expérience européenne et définition des perspectives en Algérie -

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Abstract:

Today's talk of the use of electric cars is no longer a fantasy or a distant future, but living a reality that exceeded the expectations of analysts and experts, even some major car manufacturers, who until recently did not believe in the success of these alternative engines, and considered that fossil fuels will remain dominant for years in this field. Auto industry experts have speculated that 2025 will be the turning point for these "environmentally friendly" cars, but what happened is that technology has advanced faster than expected, and government support provided by countries to invest in this area increased, especially in Europe and some Asian countries, both in the electric engine industry and in the development of basic energy storage batteries. Algeria is gradually spreading the use of electric cars in the 2030 horizons, seeking to reduce fuel use.

Keywords: Consumer; European consumer; Environment; Electric cars; Algeria.

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Le résumé:

Le discours actuel sur l'utilisation des voitures électriques n'est plus un fantasme ou un avenir lointain, mais une réalité concrète qui a dépassé les attentes des analystes et des experts, ainsi que de certains grands constructeurs automobiles, qui, jusqu'à récemment, ne croyaient pas au succès de ces moteurs alternatifs et considéraient que les carburants fossiles resteraient dominants dans ce domaine pendant encore des années. Les experts de l'industrie automobile avaient prévu que 2025 serait le tournant pour ces voitures "écologiques", mais ce qui s'est passé, c'est que la technologie a progressé plus rapidement que prévu. Le soutien gouvernemental accordé par les pays pour investir dans ce domaine a également augmenté, en particulier en Europe et dans certains pays asiatiques, tant dans l'industrie des moteurs électriques que dans le développement des batteries de stockage d'énergie de base. L'Algérie étend progressivement l'utilisation des voitures électriques avec un horizon fixé à 2030, cherchant à réduire l'utilisation des carburants.

Mots-clés : Consommateur; Consommateur européen; Environnement; Voitures électriques; Algérie.

1. INTRODUCTION

Electric cars are considered environmentally friendly because they do not emit harmful gases, are easy to operate, and produce minimal noise. Many governments worldwide are encouraging their citizens to switch to electric cars, achieving dual benefits: contributing to national goals of reducing greenhouse gas emissions and lowering pollution levels in urban areas.

From this perspective, the central question arises:

What is the current state of environmentally friendly electric cars in Europe, and how can Algeria benefit from this experience?

Study Objectives:

This study aims to achieve the following:

- Identify the main advantages and disadvantages of electric cars;
- Explore the factors influencing European consumer attitudes toward environmentally friendly electric cars;
- Highlight the European countries that have made significant progress in this field;
- Examine the incentives offered by European countries to encourage citizens to adopt electric vehicles and assess the potential for Algeria to benefit from this experience.

Importance of the Study:

The importance of this study lies in shedding light on the European experience with environmentally friendly electric cars and identifying future opportunities for Algeria. It also emphasizes the various incentives provided by European countries to shift negative consumer perceptions and encourage the adoption of electric vehicles, which could inform Algeria's efforts to develop its electric car industry.

Study Methodology:

The research paper employs a descriptive-analytical approach to examine the phenomenon and its various variables. It combines theoretical analysis to highlight the knowledge aspect and statistical data to explore the relationship between variables.

2. The Nature of Transport Activity:

This section discusses the nature of transport activity, addressing its definition, characteristics, and importance.

2.1 The Nature of Transport Activity:

Transport, linguistically, comes from the Arabic root "نقل" which means to transfer something from one place to another, or to convey a message⁽¹⁾. According to the Encyclopedia of the Arab World,

(1) Mustafa Youssef Kafi, Transport Economics and the Environment within the Framework of Sustainable Development Regulations, Algeria: Alpha for

transport is defined as: "The movement of individuals from one place to another"⁽¹⁾.

Transport activity is also defined technically as: "The mechanical movement of goods from one place to another"⁽²⁾. In other words, it is "the relocation of a commodity from a position of lesser utility to a position of greater utility"⁽³⁾.

Algerian law defines transport as: "Any activity through which a natural or legal person transports individuals or goods from one place to another using any type of vehicle"⁽⁴⁾. From these definitions, we can conclude that transport is an activity focused on the movement and relocation of people and/or properties from one place to another to create spatial and temporal utility.

2.2 Characteristics of Transport:

The characteristics of transport can be examined from two angles: the distinguishing features of demand for transport services and the distinguishing features of supply⁽⁵⁾.

2.2.1 Distinguishing Characteristics of Demand for Transport Services:

These include:

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Documents, 2017, p. 20

(1) The Arabic Encyclopedia, Volume 25, Riyadh: Al-Mawsooa Publishing and Distribution Foundation, 2010, p. 62.

(2) Ali Al-Mushaqba and others, Shipping and Insurance Management, Amman: Dar Al-Safaa for Printing, Publishing, and Distribution, 2003, p. 45.

(3) Mohammad Hafiz Hijazi, Introduction to Marketing, Alexandria: Dar Al-Wafaa for Printing and Publishing, 2005, p. 174.

(4) Article 16 of Law No. 88-17, dated May 10, 1988, concerning the guidance and organization of urban transport, Official Gazette of the People's Democratic Republic of Algeria, No. 19, p. 785.

(5) Riad Jdaar, The Economics of the Transport Sector and Its Issues in Arab Countries, unpublished doctoral thesis, Algeria: University of Algiers 3/Faculty of Economic Sciences, Commercial Sciences and Management Sciences, 2015-2016, pp. 49-54.

A. Demand for transport services is derived or induced: This means that transport services of all types are not sought for their own sake, despite being an independent activity; they are requested to achieve various purposes. For instance:

1. The demand from traveling individuals for transport services stems from their desire to move to workplaces or places where trade transactions occur, as well as their desire to enjoy leisure time and relaxation or to go to markets.

2. The demand for goods transport services arises from the desire to move raw materials and capital goods to manufacturing centers to prepare a consumable product, and then to transport finished goods to distribution and consumption centers to achieve and maximize product profitability and consumer welfare.

B. Variation in demand rates for alternative transport services according to the availability of time for transport service delivery: Demand rates for transport services are affected by the ability of the mode of transport used to reduce the time taken for the journey from one place to another. The importance of time saved derives from the opportunity cost associated with the duration of the trip, which largely depends on personal assessment of the benefits derived from extending leisure time as a result of reduced travel time.

C. Variation in demand for transport services according to economic activity levels: Generally, demand for transport services fluctuates and is irregular, as there is a close connection between the demand for transport services and economic fluctuations (booms and recessions). Demand for goods transport tends to increase during economic booms due to the expansion of production and consumption centers, which also applies to travel for leisure purposes, where the economic boom results in higher individual incomes that allow for leisure and vacation trips. Conversely, in economic downturns, demand for transport services tends to decline due to decreased production and trade, affecting demand for transporting raw materials and production inputs, as well as reduced demand for transporting

finished products to marketing outlets. Additionally, there is a drop in travel demand due to declining individual income levels, leading to higher opportunity costs for leisure and free time.

D. Fluctuations in demand rates for transport services:

1. Daily fluctuations in demand for transport services: Demand for travel fluctuates based on the proximity of labor concentration areas to production centers, as well as different work and school schedules.

2. Weekly fluctuations: Limited to demand for transport services for work or weekend leisure, along with regulations governing weekly time off for workers.

3. Seasonal fluctuations: Seasonal fluctuations in the demand for goods transport vary according to the diversity of economic activities across different sectors, with these fluctuations being more pronounced in agriculture than in industry, due to the specific timing of agricultural cycles.

2.2.2 Distinguishing Characteristics of Supply of Transport Services:

These include:

A. Variation in transport service costs depending on the mode of transport used: The costs of passenger transport services include all amounts paid for the transport method, as well as costs for goods transport services, such as shipping, insurance, and storage along the route.

B. The transport sector's services are characterized by non-storability: Transport services, regardless of the mode, are unique in that they are consumed as they are produced, making them non-storable.

C. The transport sector's services are characterized by non-divisibility: Transport services are offered continuously and

independently, starting from the departure point to the destination without division.

D. Variation in the supply rates of transport services according to the reliability of service completion: This characteristic refers to the variability in the availability of transport services across different modes, based on their transport capacity and the extent to which they are affected by natural and economic factors that may hinder the flow of transport.

E. Variation in the supply of transport services concerning service frequency and completion: This refers to the different modes of transport regarding their ability to repeatedly provide service, or the number of trips a mode can make between departure and arrival points within a certain timeframe. In this regard, land and air transport lead, followed by rail transport, and then water transport. The capacity to complete services fully refers to the ability of a particular transport mode to carry out the entire journey without needing intermediary transport means. Land transport is generally the best in this regard, effectively moving passengers from residential areas and workplaces to production or marketing centers, as well as transporting goods from production centers to manufacturing sites, and then to distribution and consumption outlets.

2.3 Importance of Transport:

The transport sector is considered one of the most vital sectors for comprehensive development in advanced countries, with urban transport planning having multiple aspects. It is seen as an integral part of overall urban planning due to its close connection to urban structure and land uses, which are among the main factors generating trips. The importance of transport can be illustrated through the following⁽¹⁾:

(1) Saad al-Din Ashmawi, Organization and Management of Transportation: Foundations, Issues, Solutions, Riyadh: Dar al-Mareekh for Publishing and

2.3.1 Economic Importance of Transport Activity:

The importance of transport in the national economy is evident through the following elements:

- It influences economic development strategies, as the transport sector is at the forefront of supporting the economic structure and is a fundamental pillar of the national economy. Balanced growth across the sectors cannot be envisioned without meeting their transport needs.

- The transport sector contributes to economic development by linking production areas with consumption areas.

- It is one of the key sectors providing numerous job opportunities in society, as human labor is essential to successfully carry out transport tasks.

- Transport increases rates of capital formation (both physical and human), facilitating the transfer of technological knowledge, which enhances economic growth and increases production capacity—one of the crucial determinants of economic development.

- Economic integration and interdependence, as transport addresses distance and expands markets while utilizing natural and human resources, increases production, and transfers goods and labor to areas where they are most beneficial.

- It improves the balance of payments by enhancing the country's export capacity and generating foreign currency, alongside providing imports of developmental goods, some of which support industries specializing in export production and offering alternatives to imports, thereby reducing the trade deficit.

- Advancements in transport have increased the value of land and raised rental prices.

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Distribution, 2005, p. 153.

- Transport aids in organizing industries and reducing production costs through specialization and division of labor within regions or industries.

- It also contributes to the localization of industries in optimal locations, being a significant variable considered when choosing project sites.

- Large-scale production economies are achieved, as expanding market areas increases the share of organizations, allowing for larger-scale production, leading to reduced costs and lower product prices.

- Transport helps bring producers and consumers closer together, fostering competition and stabilizing prices.

- The advancement of transport leads to a balance in supply across various markets; the lower the transport costs, the more pronounced this balance becomes, helping to expand markets and combat economic downturns resulting from overproduction.

2.3.2 Social Importance of Transport Activity:

The social importance of transport activity is reflected through the following:

- It redistributes populations, as people historically concentrated around ports and rivers, but advancements in transport have allowed for more balanced population distribution in other regions.

- Undoubtedly, advancements in transport have contributed to the progression of sciences, increased security, the unification of dialects, and improved social welfare.

- Transport has facilitated urban growth to the sizes we see today.

- It eases individual movement, leading to cultural exchange among nations and peoples.

- Transport fosters cohesion among different parts of a nation, being a key element in community development, with a country's

progress measured by the adequacy and advancement of its transport means.

Basics of Electric Cars:

Traditional gasoline or diesel-powered cars, which people rely on daily for transportation, contribute significantly to environmental pollution and air quality degradation. As a result, there is a growing need to transition to environmentally friendly alternatives, such as electric cars powered by electricity, and hybrid cars that combine fuel and electric power.

3. Electric car basics:

3.1 Concept of the Electric Car:

An electric car, often referred to as a "clean" or "pure" vehicle, is defined as: "a car that relies on electric power for its operation, where the traditional engine is replaced by an electric motor. This motor is powered by high-capacity storage batteries that need to be recharged at fixed charging stations»⁽¹⁾.

Many people confuse the concept of electric cars with hybrid cars, so it is important to clarify the distinction between the two:

- Electric cars rely entirely on an electric motor (100% electric) for propulsion, producing no carbon dioxide (CO₂) emissions.
- Hybrid cars use both an electric motor and a fuel engine (gasoline or diesel), leading to varying levels of carbon emissions.

3.2 Electric cars components:

Electric cars resemble traditional vehicles in terms of appearance and interior design but differ in their core components, which include

(1) Quentin Mauguit, "Voiture électrique : qu'est-ce que c'est ?", Publié le : 01/01/2021, Consulté le: 13/10/2024, Sur: <https://www.futura-sciences.com/tech/definitions/voiture-electrique-voiture-electrique-13758/>

the following⁽¹⁾:

1. Control Unit: Acts as an intermediary between the battery and the motor, transferring power from the battery to the motor. Voltage regulators located between the motor and the control unit ensure the motor receives the appropriate power level.

2. Electric Motor: Converts electrical energy into mechanical energy, which propels the car forward.

3. Battery: The storage unit for energy, with several types available:

- Lithium-ion batteries: These are the most cost-effective, high-performing, and lightweight, commonly used in digital cameras and smartphones.

- Lead-acid batteries: These are more affordable and popular, with a 97% recycling rate.

- Nickel-metal hydride batteries: Though more expensive than lead-acid batteries, they offer better output and performance.

Electric cars are charged in a manner similar to electronic devices, using a charging cable to supply the car with 230V from either a public or home charging station. The charging speed increases with the power provided. For example, home charging offers around 2 kW per hour, while public charging stations can fully charge a battery in 5 to 8 hours, depending on its size⁽²⁾.

3.3 Advantages of Electric Cars:

Several advantages make electric cars competitive with traditional

(1) Mohammed Ahmed bin Ali, "Electric Cars: How Do They Work? And What Are Their Internal Components?" , Publication Date: 04/03/2021, Retrieval Date: 07/10/2024, from: <https://www.mena-tech.com/electric-cars-how-do-they-work-and-what-are-their-internal-components/>

(2) Volkswagen, "Recharge and Range: How Can I Charge?", Published on: 01/01/2021, Accessed on: 13/10/2024, At: <https://www.volkswagen.be/en/e-mobility-and-id/all-information-on-electric-driving/recharge-range-of-an-electric-car/how-can-i-charge.html>

vehicles, and they are seen as the cars of the future⁽¹⁾:

- Lower costs: Over the long term, electric cars are cheaper to operate than traditional vehicles, as charging costs are lower than fueling costs.

- Fewer breakdowns: Electric cars require less frequent maintenance since they lack the complex mechanical parts found in fuel-powered engines.

- Safety: Electric cars are safer, as they are less prone to fires or explosions.

- Reduced carbon emissions: Electric cars produce fewer greenhouse gases, up to half the emissions of traditional cars. They can also be charged using renewable energy sources like solar panels, further reducing emissions and contributing to cleaner air and less dependence on petroleum.

3.4 Disadvantages of Electric Cars:

Despite their advantages, electric cars face certain challenges, including⁽²⁾:

- Difficulty finding charging stations: Drivers may struggle to locate suitable charging stations during travel.

- Long charging time: Charging can take over 3 hours, making it difficult to plan long trips, as electric cars have limited range (on average, 160 kilometers per full charge). Frequent charging over long distances also degrades battery life.

- Increased weight: Electric cars are heavier due to larger battery sizes, with some batteries weighing up to 450 kg, leading to faster energy consumption.

(1) Yasmin Saif & Yasmin Koukash, "What are the advantages and disadvantages of electric cars?", Publication date: 11/08/2021, Retrieval date: 07/10/2024, from: <https://popsciarabia.com2-29558/> //

(2) Yasmin Saif & Yasmin Koukash, Op.cit.

- Increased load on the power grid: The growing use of electric cars may strain power grids, with some experts predicting that future demand could exceed grid capacity.

- Not entirely eco-friendly: Electric cars still produce around 150 grams of CO₂ per kilometer. Additionally, the electricity used to charge these cars often comes from fossil fuel combustion, contributing to greenhouse gas emissions. The production of batteries also generates significant carbon emissions.

4. The European Experience with Electric Vehicles:

Electric vehicle sales in Europe surpassed 500,000 units in 2020, marking a positive shift in consumer behavior towards environmentally friendly vehicles, according to a report by The Guardian⁽¹⁾. The European Union, since April 2021, has enforced a maximum CO₂ emissions limit of 95 grams per kilometer for manufacturers, aiming to reduce this by 55% by 2030 and entirely by 2050, making electric cars the only vehicles allowed on European roads⁽²⁾. However, these figures are still under debate and pose significant challenges for companies in the sector. By 2027, new rules will tighten pollution standards for combustion engines⁽³⁾.

Among European countries, the Netherlands leads in readiness to transition to electric vehicles, boasting a mature market thanks to a vast network of charging stations—75,000 stations, nearly a third of those in the EU⁽⁴⁾. In 2020, electric vehicle sales accounted for 69% of

(1) Mohamed Abdel-Sanad, "Electric vehicle sales in Europe exceed 500,000 units in 2020," Al-Mal Newspaper, publication date: 06/12/2020, retrieval date: 07/10/2024, from: <https://almalnews.com/electric-vehicle-sales-in-europe>

(2) France24, "The EU adopts the objective of reducing its carbon emissions by at least 55% by 2030", Published on: 21/04/2021, Accessed on: 07/10/2024, At: <https://www.france24.com/fr/europe/20210421-l-ue-adopte-l-objectif-de-r%C3%A9duire-ses-%C3%A9missions-carbone-d-au-moins-55-d-ici-2030>

(3) Avere-France, "Electric vehicles cheaper than thermal models by 2027," Published on: 25/05/2021, Accessed on: 09/10/2024, At: http://www.avere-france.org/Site/Article/?article_id=7997

(4) France24, Op.cit.

the market share in the Netherlands (Electric). This is largely due to the Dutch government's financial incentives, offering grants up to 4,000 euros to assist with purchasing new or used electric vehicles⁽¹⁾, and a five-year road tax exemption for new electric vehicles (Intelligent-mobility)⁽²⁾.

Norway is also at the forefront of the electric vehicle revolution, aiming to ban the sale of fuel-powered cars by 2025. As a leader in clean energy, with 95% of its energy coming from hydropower, electric vehicles fit perfectly into Norway's renewable energy framework. In 2020, electric vehicles represented 54% of new car sales in Norway⁽³⁾. This success is attributed to government incentives such as VAT and road tax exemptions⁽⁴⁾.

The United Kingdom is another major player, surpassing one million electric vehicle sales in 2020, including hybrids⁽⁵⁾. The government has implemented a grant program offering up to £2,900 to private buyers of electric vehicles⁽⁶⁾. The UK plans to ban the sale of new gasoline and diesel cars by 2030, though hybrid vehicles will be

(1) Mohammad Zaqdan, "The Netherlands Makes Significant Progress in Electric Vehicle Sales," Energy Website, Publication Date: 01/10/2021, Retrieval Date: 12/10/2024, from: <https://attaqa.net/2021/01/10/>

(2) Shawky, Ahmed. "Netherlands and Norway are at the Forefront of European Countries Ready to Switch to Electric Cars." Al Mal Newspaper, 27 Oct. 2020. Accessed 07/10/ 2024. <https://almalnews.com/>.

(3) Pierre-Henry Deshayes, "La norvège, premier pays à dépasser les 50% de voitures électriques vendues", France-Presse, Publié le : 05/10/2021, Consulté le : 09/10/2024, Sur: <https://www.lapresse.ca/auto/2021-01-05/la-norvege-premier-pays-a-depasser-les-50-de-voitures-electriques-vendues.php>

(4) EcoCO2, "La norvège royaume de la voiture électrique", Publié le : 09/01/2019, Consulté le : 09/10/2024, Sur: <https://www.ecoco2.com/blog/la-norvege-royaume-de-la-voiture-electrique/>

(5) Mona Bediwi, "The New York Times: Tesla Electric Cars Will See Significant Developments This Year," Published: 01/02/2020, Retrieved: 09/10/2024, from: <https://mazadds.com/>

(6) Renault Group, "Tout sur les aides à l'achat de voitures électriques au Royaume-Uni", Publié le : 17/03/2021, Consulté le : 09/10/2024, Sur : <https://www.renaultgroup.com/news-onair/actualites/tout-sur-les-aides-a-lachat-de-voitures-electriques-au-royaume-uni/>

allowed until 2035, driving further adoption of electric vehicles while compelling manufacturers to invest billions in developing long-range electric models⁽¹⁾.

Ireland, Sweden, Switzerland, Germany, and Austria also show strong growth and commitment to electric vehicles, each offering unique incentives and aiming for carbon neutrality by 2050. Italy, despite facing challenges in charging infrastructure, aims to lead the European market by incentivizing consumers and encouraging the purchase of European-manufactured electric vehicles with grants up to 3,500 euros⁽²⁾.

5.The Electric Vehicle Eco-Friendly Project in Algeria:

The emergence of electric vehicles on both international and regional levels marks the beginning of a strategic vision aimed at identifying new professions associated with this innovative mode of transportation. As car manufacturers increasingly shift towards producing electric vehicles at the expense of combustion engine vehicles, it signals a need to revise the development strategies for both direct and indirect stakeholders in the automotive sector.

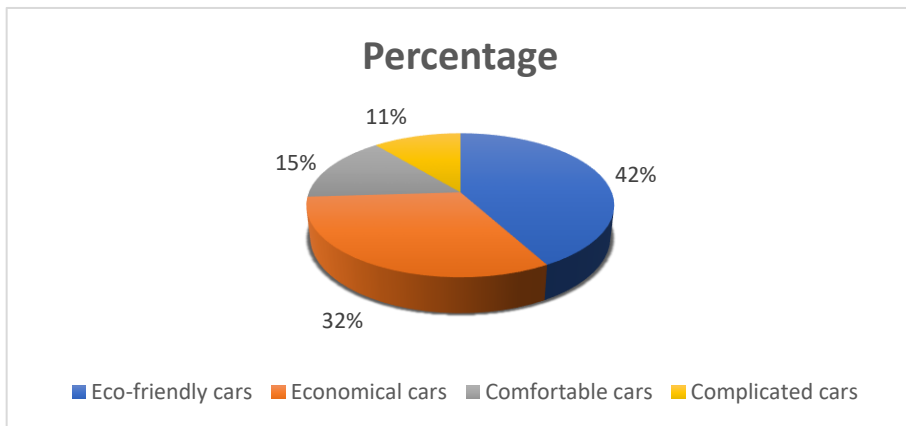
In this context, Algeria's Naftal Company has initiated efforts to explore the development of electric transportation in anticipation of changes in the automotive environment within the country. In 2020, the company conducted a field study on a representative sample of the Algerian population to gauge consumer attitudes toward eco-friendly electric cars. The key findings of the study were as follows⁽³⁾:

(1) Mona Bediwi, Op.cit.

(2) Shawky, Ahmed, Op.cit.

(3) Reuters, "L'Italie va accorder des aides à l'achat pour les voitures thermiques Euro 6", Comité des constructeurs français d'automobile (CCFA), Publié le : 03/07/2020, Consulté le : 09/10/2024, Sur : <https://ccfa.fr/actualites/litalie-va-accorder-des-aides-a-lachat-pour-les-voitures-thermiques-euro-6/>

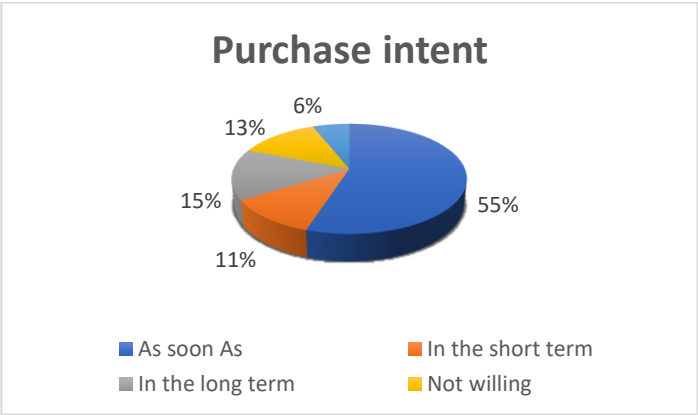
A. Consumer Awareness and Perception of Electric Vehicles in Algeria:



From the above data, it is clear that 78% of the study sample is familiar with electric cars. Among these, 42% view them as eco-friendly cars, 32% consider them economical cars, 15% regard them as comfortable, while 15% perceive them as complicated cars.

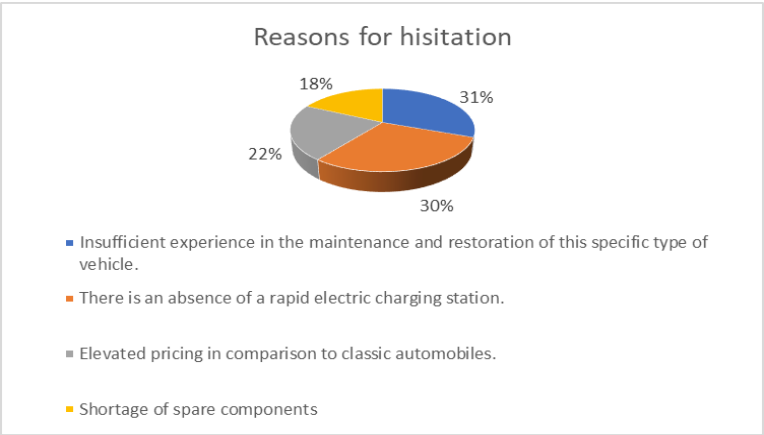
B. Intent to Purchase Electric cars:





The data reveals that 55% of the study sample is ready to purchase an electric car as soon as it becomes available in the Algerian market. Additionally, 11% are willing to buy one in the short term (within 1 to 3 years of availability), and 15% are prepared to make the purchase in the long term (after 3 years). However, 13% of the sample are not willing to buy an electric car, while 6% are undecided

C. Reasons for Hesitation in Purchasing Electric Vehicles:



The study indicates that the primary reasons for hesitation among Algerian consumers in purchasing electric vehicles are as follows:

- 31% are concerned about the lack of technicians and experts specialized in repairing electric vehicles.

- 30% are hesitant due to the fear of limited availability of fast charging stations.

- 22% attribute their hesitation to the higher cost of electric vehicles compared to traditional cars.

- 18% are worried about the potential scarcity of spare parts.

To support the shift to electric energy as an alternative to conventional fuels, "Naftal" has initiated partnerships with operators specializing in electric stations in Algeria. The following agreements have been made:

- SIEMENS Algeria (agreement signed);
- AMIMER Energy (agreement signed);
- GLOBALE Realization (representing FIMER; in negotiation phase).

As part of the project to develop a network of electric charging stations at Naftal service stations, a pilot phase has been agreed upon with partners to address various aspects and promote electric mobility. In this context:

- Siemens Algeria has provided three 22-kilowatt electric stations for free, distributed to the following sites:

- Ministry of Energy and Mines;
- Ministry of Transport;
- Ministry of Industry.

- AMIMER Energy also offered five 22-kilowatt electric stations for free, which will be installed at selected Naftal service stations in Algiers.

- Vehicle Testing with Renault:

Discussions are ongoing with car manufacturers for the acquisition of electric vehicles for the pilot phase. Renault Algeria has provided the "ZOÉ", an electric car that ranked first in sales in France

in 2020. The latest "ZOÉ" model, launched in September 2019, features a 52-kWh battery and motors with 110/135 horsepower, offering a range of up to 395 kilometers.

An agreement with Renault will provide Naftal with a prototype of the "ZOÉ" to test its compatibility with the installed charging stations.

6. The conclusion:

The key findings from this research paper can be summarized as follows:

- Europe is preparing to phase out fuel-powered cars due to the environmental damage caused by gasoline and diesel engines, with the goal of achieving carbon neutrality by 2050.

- Traditional gasoline and diesel-powered vehicles are facing their biggest challenge since their invention, with a ban on their sales in Europe set for 2035 due to their high carbon emissions.

- In efforts to combat environmental pollution and climate change, European countries are working to reduce carbon dioxide (CO₂) emissions by promoting clean, environmentally friendly electric vehicles.

- Electric vehicles are attracting European consumers as green transportation solutions that help preserve the environment. However, their prices remain relatively high compared to gasoline and diesel models.

- Electric vehicle sales in Europe are witnessing significant growth, driven by generous government subsidies that stimulate demand and encourage consumers to switch to environmentally friendly electric cars.

- European consumers benefit from exemptions from road taxes and value-added tax (VAT) when they switch to electric cars, as some European governments freeze or reduce these taxes for electric vehicles, while increasing them for high-emission vehicles.

- Despite intensive efforts to develop electric vehicle infrastructure in Europe, the number of charging stations remains insufficient to meet the growing demand, potentially hindering the electric transition.

- Electric vehicle technology is continuously evolving, with major European car manufacturers transitioning to electric engines, even though their combustion engines are among the most efficient globally.

- Algeria has taken proactive steps towards developing electric transportation through studies and agreements in this regard.

Based on the results of this study, several suggestions and recommendations for the Algerian government to benefit from the European experience in the field of environmentally friendly electric vehicles can be proposed:

- Adopt policies that encourage the reduction of greenhouse gases from vehicles, leading to improved air quality and reduced reliance on petroleum, which may lower the incidence of respiratory diseases.

- Promote widespread awareness of the importance of transitioning to electric vehicles to protect both the environment and human health.

- Improve consumer attitudes towards electric vehicles by continuously enhancing battery efficiency, reducing costs, expanding the number of charging stations, and providing financial incentives from the government.

- Impose strict regulations and fees on the use of environmentally polluting conventional vehicles.

- Develop the necessary infrastructure for electric vehicles by establishing more charging stations to meet the growing needs of Algerian consumers.

- Increase the use of renewable energy sources to alleviate the pressure on electricity grids, which may face overconsumption in the

future.

- Reduce the prices of electric vehicles to make them more competitive with conventional vehicles.

- Enhance battery performance in terms of storage capacity and charging speed.

- Continue innovation to produce and develop better and more durable electric vehicles compared to their predecessors.